

The University in Partnership with Wisconsin

Building on a Tradition of Excellence ~ Part II



Chancellor David Ward
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FROM CHANCELLOR DAVID WARD

■ Based on the most recent statistics, UW-Madison's economic impact on the state in 1990 was \$3.4 billion in direct and indirect spending (which results when money recirculates and is re-spent in the community).

■ Some 61 percent of the business executives interviewed in a February 1995 state-wide poll say the UW System is very important to the economy, up from 51 percent in 1991.

■ UW-Madison ranked third among the nation's universities in research-and-development spending in fiscal year 1993-94, with a total of \$372.4 million, most of which is spent locally.

■ The Wisconsin Alumni Research Foundation has obtained 900 patents, resulting in gifts totalling \$316 million to the university, since its founding in 1925. Some 3,275 discoveries have been directed to WARF in that time.

■ At least 64 technology-based Wisconsin companies have their origins rooted in UW-Madison.

■ More than 141,000 people participated in 2,300 continuing education courses and workshops in 1994.

■ Some 100,000 Wisconsin citizens outside the university community use UW-Madison libraries each year.

■ Each year, 18,000 patients are cared for at UW Hospital and Clinics.

Updating the Wisconsin Idea

Throughout this century, the university has maintained its status as a preeminent teaching and research institution, and



Ward

we are dedicated to ensuring the university's future success. Over the past few years, for example, we have made major efforts both to reconceptualize undergraduate education and to remodel and expand our research facilities.

But our priorities have also concentrated on revitalizing and redefining our partnership with Wisconsin and its citizens, for this bond is an integral component of our mission to create, integrate, transfer and apply knowledge. In this report, we feature many examples of this partnership in order to illustrate how we are striving to share our knowledge, collaborate with and learn from the people of Wisconsin.

The university's partnership with the state began nearly 150 years ago and was bolstered by the land-grant institution designation in 1866. The Wisconsin Idea, the philosophical framework for this partnership, became a national model. Some of the university's earliest efforts became a part of the national fabric — the drafting of national legislation for social security and unemployment compensation, for example, and the breakthrough development of a method to irradiate vitamin D to fortify foods and prevent rickets.

Our commitment to the citizens of Wisconsin is stronger than ever as we approach the 21st century. Today we are building new relationships and creating different connections. We are striving to encourage joint efforts with a variety of public and private institutions and to enhance our use of information technology on behalf of a variety of customers. Many of these linkages and activities grow out of partnerships with state and national funding agencies, the University of Wisconsin-Extension, and private business and industry.

Our efforts to make contributions span all disciplines. The multidisciplinary nature of

these activities demonstrates the collaborative response we have developed to confront issues that face Wisconsin. When our faculty, staff and students sense a need within the Wisconsin community, or they are faced with a challenge that does not fit neatly within one discipline, they show their willingness to cross departmental boundaries to apply their knowledge. (Because of this collaborative effort, many of the activities highlighted in this report could fit into several categories.)

In addition to campus-based learning for more than 40,000 students (most from Wisconsin), we also serve thousands of the state's citizens through our many and varied outreach programs. We share new technologies and areas of expertise to improve Wisconsin's economy, environment, agricultural and industrial base, health care, businesses and schools — in short, Wisconsin's quality of life. Every year, faculty, staff and students are engaged in individual public service activities as well as formal UW-Madison programs designed to serve the state.

The significance of our partnership activities is illustrated by a survey conducted in February for the University of Wisconsin System. The survey found that the importance of access to university technical and research services to Wisconsin businesses has increased from 34 to 61 percent in the past three years.

Our activities, be they in the classroom, laboratory, field, or communities across the State, are becoming increasingly integrated and overlapping. As faculty and staff apply basic research concepts to new problems, not only do they serve as a valuable resource to the state, but they further their own research knowledge. Our undergraduate and graduate students benefit from the experience of information transfer. As we engage in these partnerships, we listen to and learn from the state's citizens, their elected officials, our alumni, and our many friends throughout Wisconsin.

This overview provides a sampling of the university's partnership activities. Consider it an introduction to some of the many ways that UW-Madison contributes to and benefits from the people of Wisconsin. I know you will be impressed with the breadth and depth of these partnerships and how we hope they reflect a beginning of a new and more dynamic expression of the Wisconsin Idea.

I TECHNOLOGY TRANSFER

TRANSFERRING THE RESULTS OF UNIVERSITY APPLIED AND DIRECT RESEARCH TO SOLVE REAL-WORLD PROBLEMS

■ Americans now get one-third of their vitamin A — an essential nutrient — from carrots. The level of beta-carotene, the precursor of vitamin A, in carrots has doubled over the last 30 years, thanks largely to carrot breeding lines developed in the College of Agricultural and Life Sciences' horticulture department.

■ Sweet corn breeders at the College of Agricultural and Life Sciences aim to get Midwesterners their first ears of the summer a bit sooner. They have developed a half-dozen commercial varieties of super-sweet corn and are now working to develop varieties that tolerate cold weather better and can be planted earlier in Wisconsin.

■ The now familiar images of weather patterns that we see on television weather reports result from the spin-scan camera, an invention developed at the Space Science and Engineering Center. The center continues to design and build advanced instruments for weather satellites.

■ A Wisconsin firm is supplying red dye from beets to the food industry, with help from College of Agricultural and Life Sciences research. The natural dye, used in a wide variety of meat, bakery, gelatin and related products, is an alternative to synthetic food colorants. The Wisconsin plant that grows the beets is the primary producer of beet dyes in the United States.

■ People with disabilities find professional success

Trace Center develops technology and makes products more accessible to people with mental or physical challenges.

Cathy has cerebral palsy. She also has a resale clothing business in southeastern Wisconsin. A software innovation, developed for IBM by the Trace Research and Development Center at UW-Madison, allows Cathy to computerize her orders and inventory.

She enters her data with a stick gripped in one hand, thanks to a program that allows her to control keys — including the all-important “shift” key — that ordinarily require two hands to operate. A similar feature from Trace, StickyKeys, is now built into all Macintosh computers and costs virtually nothing to incorporate.

Cathy is not alone in reaping the technological benefits originating at Trace. Since 1971, the center has opened new economic and professional avenues for thousands of people with disabilities nationwide.

A joint project of UW-Madison's Waisman Center and Department of Industrial Engineering, the center began by addressing communication needs of nonvocal, severely disabled children and adults. However, in the late 1970s, the mission expanded to include the goal of making information technology more accessible to people with physical or mental challenges.

Today, Trace distributes a CD-ROM listing thousands of assistive products, services and publications. The center also operates clinical services to help people choose and design communications systems best suited to each individual need.

AccessDOS, the low-cost software tool that Cathy uses for her business, is already available and has even been translated into Japanese. Currently, the center is working on helping people with disabilities gain access to the Internet. In addition, Trace works directly with such computer firms as Apple, IBM, Digital Equipment Corp., Honeywell and Microsoft to adapt their products for people with disabilities.

According to Gregg C. Vanderheiden, director of the Trace Center, companies have proved most receptive to the potential Trace

can realize. “Industry is willing to build accessibility into its standard product,” he says. “The incorporation of these access features into standard products has had a profound effect on the lives of people with disabilities, and provides benefits to individuals without disabilities as well.”

■ Water test helps local officials detect lethal toxins

UW-Madison scientist contributes his services to help communities find out if naturally occurring toxins are in their drinking water.

Some of the most dangerous poisons in the environment have nothing to do with giant factories or artificial chemicals. Instead, they are natural compounds produced by algae in lakes and ponds, and by molds that grow on crops.

Detecting low levels of these toxins in Wisconsin's water supply and in farm crops has proved difficult for scientists and regulatory agencies.

But the Department of Natural Resources (DNR) and Department of Agriculture, Trade and Consumer Protection — which must deal with these environmental toxins — have found a ready ally in Fun Sun Chu, a professor in the College of Agricultural and Life Sciences' Department of Food Microbiology and Toxicology.

As an environmental toxicologist for 25 years, Chu has developed internationally recognized tests that allow scientists to detect extremely low levels of natural toxins in foods, plant and animal tissues, and environmental samples.

During the past decade, Chu's work has resulted in a string of new tests for compounds such as aflatoxin — a mold toxin on corn and peanuts thought to be the world's most potent carcinogen — and microcystins — algal toxins that also promote cancer and that are, ounce for ounce, more lethal than strychnine.

In 1993, Chu cooperated with the DNR and local water utility officials in Appleton, Oshkosh, Neenah and Menasha, by screening for microcystins in the water they draw from Lake Winnebago. Chu's tests found that the treated drinking water had very low levels of toxins despite the presence of higher levels before treatment. While there are no federal

TECHNOLOGY TRANSFER

■ With the help of the Wisconsin Center for Space Automation and Robotics in the College of Engineering, Quantum Devices Inc., a company in Barneveld, Wis., now produces arrays of LEDs that emit the exact wavelength of light that plants use in photosynthesis. Quickly becoming standard equipment in botany labs and tested in the space shuttle Discovery, these high-density, low-cost LEDs are now replacing expensive lasers in devices designed to fight cancer.

■ Through the General Library System, UW-Madison faculty and faculty at 16 other universities have access to an organic chemistry database. Crossfire allows chemists to do their own structure searches of 6.5 million organic chemicals, their properties and literature references. This is the first use of client/server technology to share a single database over the Internet among university libraries in Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, Pennsylvania and Wisconsin.

■ Scientists in the College of Agricultural and Life Sciences developed a workshop to deliver the latest DNA technologies directly from the research lab to the livestock breeding industry. Participants learned to use DNA technology to identify an animal's genes for performance, disease resistance and production.



Fun Sun Chu, professor of food microbiology and toxicology, has developed internationally recognized tests that allow scientists to detect low levels of natural toxins in foods, plants and animal tissues, and environment samples. His tests were used to identify low levels of toxins in Wisconsin's Lake Winnebago.

or state safety standards for microcystins, the tests assured local officials that their treatment plants greatly reduced microcystin levels. "It's unlikely that such low levels of microcystin in drinking water affect people's health in the short term," Chu says.

As is often the case with new methods for unanticipated emergencies, state agencies have had little money to support Chu's efforts. He usually contributes his services and those of his laboratory technicians at no cost, while the state reimburses him for chemical reagents.

Despite the costs, Chu views his association with state agencies as an opportunity to apply the techniques he has developed to the problems government agencies and citizens face. "Every scientist wants to expand what we know about the world and how it works, but I'm especially proud to see that my research has real practical value," Chu says.

■ Solar Energy Laboratory collaborates with businesses

From aluminum hot dogs to solar water heaters, this engineering lab develops a range of answers to industry's high-tech problems.

A hot dog made of aluminum — it doesn't sound appetizing, but it is actually helping researchers at the Oscar Mayer plant in Madison improve the quality of their most popular product.

In 1991, Oscar Mayer officials approached mechanical engineering professors William

Beckman, John Mitchell and Sanford Klein at UW-Madison's Solar Energy Lab. The Oscar Mayer Foods Division of Kraft Foods wanted to apply engineering principles to the processing of hot dogs and bologna, which accounts for millions of pounds of production at the Madison plant each year.

Jerry Marra, senior research engineer at Oscar Mayer, says the company needed a more sophisticated look at what was happening on its production line. For his master's degree, James Spielbauer developed an aluminum hot dog to help write a software model of the cooking process. He hooked up the hot dog replica to a small, heat-tolerant data-collector, and placed the devices on the tray of a huge convection oven at the Madison plant. A few minutes later, when the "cooked" dog emerged from the oven, he downloaded information on cooking conditions into a computer.

The results from that computer model, Marra says, have "shortened some of our cooking cycles ... and that translates to increased throughput, and increased efficiency." When used by Oscar Mayer's R&D department, the software Spielbauer developed helps the designers "speed the transition from product concept to production process," he adds.

UW-Madison's Solar Energy Laboratory has carried out a variety of intriguing collaborations with Wisconsin businesses over the past few years. The lab helped evaluate equipment for Carnes, Inc., a Verona manufacturer of heating and ventilating equipment. And it helped increase output at the world's largest solar water-heating system, operated by

TECHNOLOGY TRANSFER

■ Faculty and students in the Nuclear Engineering and Engineering Physics Department adapted computer software for Wisconsin's nuclear plants at Kewaunee and Point Beach in order to simulate crises and problems. The software allows the plants to train workers to handle such problems without actually experimenting on their expensive, complex nuclear machines.

■ Each quarter, a College of Agricultural and Life Sciences research demographer provides the state Department of Corrections with revised forecasts of the state's prison population and people on parole and probation. The forecasts help corrections officials anticipate the need for prison space and to budget for prison staff and services.

■ For many small and medium-sized businesses, finding time to improve quality beyond solving the "do or die" everyday problems is difficult at best. But the College of Engineering's Center for Quality and Productivity Improvement provides advice to such firms on fine-tuning their operations. The center, for example, worked with Freedom Plastics, Inc., of Janesville, Wis. to solve problems it was having in PVC pipe-making operations.

Packerland Solar System in Green Bay.

Lab engineers are now writing software to assess how the large-scale installation of solar water heaters would affect Wisconsin Electric Power Co., the state's largest utility. The goal, says Beckman, director of the Solar Energy Laboratory, is to "evaluate what would happen if a utility aggressively promoted the installation of solar water heaters by its customers—not a few dozen, but maybe 100,000 heaters. What would be the impact on utility demand and pollution?"

Working with UW-Madison students and researchers offers companies the chance to apply cutting-edge technology to real-world problems, Marra says. The UW-Madison engineers "bring a fresh perspective, not biased by accepted wisdom. Scientifically, it's a more fundamental approach. It brings a level of mathematical sophistication that wouldn't be cost effective for us to provide."

■ And the forecast for tomorrow is ...

McIDAS guides weather forecasters and enhances education.

Whether you're listening to a tornado warning or ozone alert on the radio, watching the path of a hurricane or a space shuttle launch on television, McIDAS is the system that brings these important weather and space pictures to you.

UW-Madison's Space Science and Engineering Center designs McIDAS, the Man computer Interactive Data Access System, which receives signals from satellites 22,000 miles above the Earth and changes them into recognizable pictures of the Earth and its weather. Adding weather information gathered from around the world, forecasters and researchers use McIDAS to display and analyze weather patterns in real time, as the events happen.

The National Severe Storms Forecast Center in Kansas City uses McIDAS to decide when to issue severe weather warnings. The National Hurricane Center and U.S. weather forecasting centers for the space shuttle use McIDAS to display and analyze meteorological information.

Smaller agencies inside Wisconsin also use McIDAS. For example, Weather

Central, Inc. — which forecasts weather for the Dane County area over TV Channel 27, UW-Madison's Soil Science Department and Wisconsin's Department of Natural Resources (DNR) all rely on the information provided by McIDAS.

At the DNR's Bureau of Air Management, Bill Adamski uses McIDAS to monitor ozone close to the Earth. He gives ozone alerts mostly during the summer when the threat is highest.

By watching satellite pictures combined with other weather information on his McIDAS workstation, Adamski spots the weather conditions that herald increased ozone close to the ground: cloudless hazy days, temperatures above 80 degrees, high pressure centers to the southeast and weak southwesterly winds.

McIDAS makes it easier to alert Wisconsin residents and learn about the conditions contributing to ozone, he says. Space Science adapted McIDAS for Adamski's specific needs: "Space Science wrote special software for us that allowed us to overlay ozone information on the satellite image itself," he says.

In the state-of-the-art Watertown High School, teachers Ron Graewin and Lee Buescher use McIDAS to prepare students for a technical world. The Space Science and Engineering Center provides a computer and McIDAS software while students access real-time images over the Internet.

Chad Kreblin, now a freshman at UW-Madison majoring in meteorology, was a junior at Watertown High School when McIDAS was introduced. Watching weather patterns on McIDAS, Kreblin was awed "by the amount of power the Earth and atmosphere can generate," he says. On McIDAS, he says, "I could teach myself about the things I was curious about."

■ UIR partnerships serve as key contacts for industry

University-Industry Relations program promotes research consortia, linking university experts with industry's needs.

A Madison company developing novel approaches to preventing infectious disease credits its start to the aid of the University-Industry Relations (UIR) program, the university's conduit for technology transfer.

TECHNOLOGY TRANSFER

■ A College of Agricultural and Life Sciences wildlife ecologist has developed successful techniques for restoring wild populations of peregrine falcons, whooping cranes and California condors. Currently, he is studying the causes of the declines among Wisconsin's songbirds and leading research on how to reintroduce trumpeter swans to Wisconsin at places such as Crex Meadows.

■ Botanists in the College of Letters and Science are researching the ecology of groundlayer vegetation in Wisconsin's oak savannas. Their results are aiding efforts to restore and manage these imperilled ecosystems in Wisconsin and throughout the Midwest. These researchers are collaborating with the UW Arboretum, the Wisconsin Department of Natural Resources, the U.S. Army, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, the Nature Conservancy and other conservation groups.

■ The UW Sea Grant Institute has led the state, regional and national response to the zebra mussel invasion over the last five years. Control of zebra mussels — which are freshwater mollusks that attach themselves to solid submerged objects, including water intake pipes, boat hulls and dock pilings — is expected to cost billions of dollars over the next 5-10 years in the Great Lakes Region alone. Sea Grant has set up an early warning Lake Michigan harbor sampling program and has provided training in identifying the mussel and its larvae for the Department of Natural Resources, the power industry, municipal waterworks, lake district, and locks and dam personnel.

What is Ophidian Pharmaceuticals today began several years ago in the laboratory of Sean Carroll, a UW-Madison molecular biology and genetics professor. UIR gave the young researcher a seed grant to develop a method of creating refined, high-quality snakebite antivenoms. The research proved successful, and led to a patent and the creation of Ophidian based on a novel technology that could be applied to a wide range of therapeutic and diagnostic products.

Since its founding in 1989, Ophidian has gone on to research and develop drugs aimed at a number of emerging pathogens, such as the *E. coli* bacteria that spreads through contaminated food and can cause life-threatening kidney disease. Douglas Stafford, the president of Ophidian, says the original UIR grant was a critical first step in the company's creation.

UIR has also given the company guidance on finding federal small business grants and other UW-Madison resources for developing new products and helped review grants before they were submitted, says Stafford. The company recently completed a major grant from the federal Small Business Innovation Research program to develop antidotes to different biological poisons.

"UIR has helped us a great deal in identifying ways to access these funds. For a small business, these grants have been crucial to validating our technology and providing R&D capital," he says.

Since 1963, UIR has served as industry's first contact in finding expertise at UW-Madison. By compiling a detailed data base of university research in progress, UIR can steer business and industry contacts in the right direction to get their questions addressed.

Those questions can include anything from a perplexing assembly-line malfunction to an inquiry about licensing a technology stemming from UW-Madison research. UIR also can help companies locate specialized laboratories and equipment, and tap into networks of people involved in technology transfer.

One of UIR's growing areas is in promoting university-industry research consortia, of which there are more than two dozen on campus. In these consortia, companies and UW-Madison staff pool their resources to explore specific needs in industry.

UIR Director Steve Price notes that these university-industry partnerships are mutually beneficial. Industry can receive access to some of the latest knowledge driving their fields and benefit from applied research aimed at the needs of business. At the same time, UW-Madison faculty get important perspectives on their research from the private sector and, frequently, financial support for their work.

UIR recently instituted a computerized data base available to the public on the university's Internet connection, WiscINFO. The list includes updated information on the scholarly activity of thousands of UW-Madison faculty.

Companies also can access UIR through the World Wide Web, where they will find information on the latest UW-Madison technologies available for licensing, as well as connections to WARF (<http://www.wisc.edu/uir>).

■ Road rating system helps locals save money

PASER makes difficult decisions about road repairs easier and more objective for local community officials.

Choosing which roads to repair and selecting the type of improvement can be a tough job for local elected officials. Everyone wants the road in front of their house done first, and it can be difficult to make the best of a tight local budget.

PASER, a simple-to-use, objective system for rating road conditions developed at UW-Madison, has made the job a lot easier. "Using PASER takes the politics out of the decisions," says Bruce Stelzner, highway commissioner in Chippewa County. He and highway committee members drive over approximately 100 miles of road each year.

Using PASER — which stands for Pavement Surface Evaluation and Rating — the highway committee agrees on how each road segment rates. Then Roadware, a companion computer program, uses the information to produce a road repair priority list and budget for the committee. The Chippewa County Highway Department likes the program so well that it encourages all its towns and municipalities to use it too, says Stelzner. Nearly all do.

The PASER system is helping local officials

■ Providing expertise for improving economic performance and living standards in Wisconsin, the Center on Wisconsin Strategy (COWS) in the College of Letters and Science works with business, labor and state officials to build the infrastructure needed to support a high-wage, high-productivity economy in this state. Among its projects, the center has worked to develop high-performance firms in the state and to raise the level of vocational training on the job and in schools.

■ UW-Madison researchers are working with engine manufacturers and suppliers to improve the performance of two- and four-stroke engines, which are being used in an expanding array of devices, from lawn mowers to snow blowers to motor boats. Estimates suggest that the small engine industry and related activities account for 90,000 jobs in Wisconsin, which is home to 19 engine manufacturing companies and many suppliers. Through individual research contracts, as well as through the Wisconsin Small Engine Consortium, the UW-Madison Engineering College's Engine Research Center is working in collaboration with industry on projects to make these small engines run cleanly and more efficiently.

meet federal requirements as well, explains Engineering Professor Don Walker, director of UW's Wisconsin Transportation Information Center and chair of Engineering Professional Development. Pavement management systems are now required for all local roads that receive federal funding, and PASER meets the requirement.

Even before that rule took effect, however, many Wisconsin local officials appreciated having such a good tool for making fair and cost-effective decisions. That's why Walker helped develop PASER in 1987.

Some PASER-based "what-if" projections also helped the supervisors in the Town of New Glarus make an unpopular but cost-saving decision: that all new roads must have a permanent surface before they can be accepted by the public road system. "We looked at the costs of maintenance," says Town Supervisor Craig Galhouse. "We showed that with a double seal-coated road the town would start incurring yearly maintenance costs in five years, where if the developer paved it we wouldn't have to do any major repair for 15 years."

PASER, its related booklets, and training and computer programs are just one of the Transportation Information Center's programs. The center's mission is to give local elected officials and maintenance staffs timely information about how to maintain and improve streets, highways and bridges. The center is a joint project of UW-Madison, UW-Extension, the Wisconsin Department of Transportation, and the Federal Highway Administration.

■ Center engineers reduce manufacturing lead time

The Center for Quick Response Manufacturing works directly with companies to enhance competitiveness, lower production costs and improve customer relations.

Time is money — and increasingly, the currency of competition. That's why reducing lead time to fill orders is so important to manufacturers.

Shorter lead time means a more productive and quality-oriented workforce, and more satisfied customers. The effort can minimize customers' lost production, and lead to lower costs and higher sales and profits.

The College of Engineering's Center for Quick Response Manufacturing works directly with companies to reduce lead time in filling customer orders, saving them money and improving customer relations. The center currently works with some 25 member companies from around Wisconsin and the surrounding region on an ongoing basis, offering workshops, seminars and other short-term projects. Among the Wisconsin firms in the consortium are Marathon Electric of Wausau, Rowe Pottery Works of Cambridge and Trek Bicycle Corporation of Waterloo.

"In the long term, the strategy produces a lean and mean company," says Rajan Suri, professor of industrial engineering and director of the center. He has presented numerous seminars for industry that focus on his theories and case studies. In addition, Suri works directly with companies to customize and implement his ideas.

Beloit Corporation in Beloit, Wis., has worked extensively with Suri to squeeze unnecessary time from the manufacture of huge papermaking machines and replacement parts. When the company began its partnership with the college in 1991, lead time for new machines averaged 16 months while replacement parts required 14 to 16 weeks. Today, after implementing Suri's ideas in many areas, the company has cut lead time by an average of 35 percent for new machines and 66 percent for replacement parts.

"It requires a different way of thinking, and being more responsible in our work environment," explains Jim Schneider, Beloit's manager of materials management. "We shouldn't do things a certain way just because it's the way we've always done them."

Lead-time reduction isn't just a manufacturing issue. It encompasses the whole process, from order receipt to delivery and payment. To align everyone's thinking, Beloit invited Suri to conduct in-house seminars for its workforce of more than 300.

"Our employees now have a set of tools they can apply to any situation related to our lead time," Schneider explains, adding that the seminars have also led to a grassroots effort to implement small and large improvements throughout the company. As a bonus, Beloit Corporation has found that "both quality and costs get better as things move through the system faster," he says.

III ECONOMIC DEVELOPMENT

FORMING PARTNERSHIPS WITH BUSINESS AND INDUSTRY TO IMPROVE THE ECONOMIC HEALTH OF THE STATE

■ The university is active in 18 industrial consortia organized by UW-Madison faculty to draw together companies with common interests in supporting university research.

■ Forest geneticists in the College of Agricultural and Life Sciences have developed genetically improved pine and spruce trees that are expected to grow 10 to 30 percent faster, and have better stem form and greater disease resistance than trees previously available.

■ Research at the College of Engineering helped open new business avenues for Fisher-Barton, Inc., a lawn mower blade manufacturing firm in Watertown, Wis., and spawned a new company for its owners. Through collaboration with UW engineers, Fisher-Barton moved into the area of plasma spraying, or applying a thin coating of material to the surface of a tool or machine part to make it more resistant to abrasions and heat. As demand for this new process grew rapidly, Thermal Spray Technologies was created, applying its process to machines used in a variety of industries, including papermaking, medical, automotive and small engine.

■ Research Park supports high-tech entrepreneurs

Campus connection has helped birth of 58 businesses in park's first 11 years.

With the scientific resources of UW-Madison at their doorstep, dozens of new science and technology companies have found a productive home at the University Research Park in Madison.

The 11-year-old research park was created with the goal of using UW-Madison's research capability as a magnet in attracting and developing high-technology firms in the city. The effort has paid off in its first decade: the park now has 58 businesses and nearly 1,500 employees, and is generating almost \$1 million in property taxes annually for the city.

The park's tenants find the park's best attraction is having access to the people and resources of the university. For a fledgling technology firm, those connections have become invaluable.

"The park is trying to provide an atmosphere where companies can succeed. They're not just a landlord," says Maggie Smith, vice president of Genetics Computer Group.

The company produces software that helps genetics researchers decipher the complex chemical sequences of DNA. The company's products are central to the work of the Human Genome Project, which is attempting to unravel the basic building blocks of human life.

Genetics Computer Group is a spinoff company from the UW-Madison Biotechnol-

ogy Center. While the company is no longer part of UW-Madison, its connections with campus are crucial to its success, Smith says.

On a weekly basis, the company moves the development versions of its new software to a campus computing center, where researchers can use new enhancements and, in turn, report back any problems they encounter. And Genetics Computer Group is a constant user of the park-provided Internet connection, providing a crucial link to customers. "There are many advantages to being in close proximity to one of the top research universities in the country," she says.

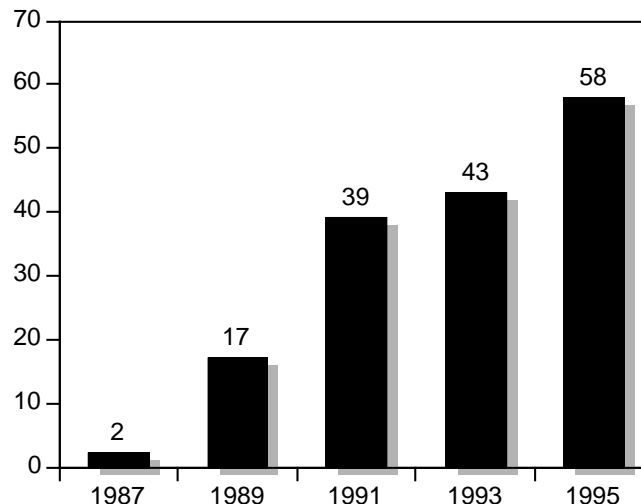
Other companies have found similar benefits from the campus connection. Tetricons, a pharmaceutical development firm, is using the groundbreaking UW-Madison research on Vitamin D to develop products for the treatment of osteoporosis and cancer. PanVera, which manufactures biological reagents for medicine, has nine consultants at the university advising them on the quality of their products and trends in the field.

The park also houses the MG&E Innovation Center, which gives upstart companies shared access to clerical staff, conference rooms and equipment, and other basic business support. The services help companies concentrate on product development and research.

"The single greatest success of the park," says Park Director Wayne McGown, "is providing a place for new entrepreneurs. We brought that about by encouraging a private sector relationship with the campus."

Already occupying more than 700,000 square feet of space, the park's buildings could

■ Number of companies at the University Research Park



Just over a decade old, the University Research Park has been a magnet in attracting high-technology firms in Madison. The park now has 58 businesses, providing jobs for nearly 1,500 employees. This chart shows the growth in the number of companies in two-year increments.

ECONOMIC DEVELOPMENT

■ Farmers who apply a fungicide to protect young soybean plants from root rot will soon be able to protect the crop with a biological control agent discovered by College of Agricultural and Life Sciences plant pathologists. The company marketing the new product expects it to cost considerably less than current methods. Based on expected costs, that could amount to a savings of \$2 million per year for soybean growers if half of them use it.

■ Specialists at the College of Engineering and UW Extension have created the Solid and Hazardous Waste Education Center to advise state businesses on the economic benefits of pollution prevention and other aspects of environmental regulations. For example, the Newco Fabrication Division of Swing-N-Slide Corp., a Janesville engineering and fabricating firm, is saving an estimated \$141,000 annually by using powder coatings instead of spray paints — a move that also reduces pollution. The center worked with 566 Wisconsin companies in 1994 to reduce pollution while saving firms money.



One of the best attractions of University Research Park, tenants find, is having access to the people and resources of the university — an invaluable connection for fledgling high-tech companies. Occupying more than 700,000 square feet of space, the park is ranked in the top one-third of the 140 research parks in the U.S. and Canada in terms of total real estate developed.

double that in coming years as it expands into property west of Whitney Way. The park is ranked in the top one-third of the 140 research parks in the U.S. and Canada in terms of total real estate developed.

■ WARF fosters economic development and research

Royalties from 72 licenses and 51 patents totaled nearly \$16 million in 1993, insuring a new generation of discoveries.

With a UW-Madison agronomy degree in hand, John Brunquell returned to his family's farm in Port Washington ready to lead a major egg production operation. He didn't realize at the time that the tide was changing dramatically for his business.

"In the late 1980s, the egg industry was repeatedly getting beat up over the issue of cholesterol," says Brunquell, the vice president of Century Acres Eggs. "We found that consumers were extremely sensitized to the health concerns."

Rather than fret over a shrinking market, Brunquell began research to lower the cholesterol content of eggs, first at Century Acres and also as a graduate student in UW-Madison poultry science. The end result was an egg that had 25 percent less fat and cholesterol on average.

That's where Brunquell's partnership began with the Wisconsin Alumni Research Foundation (WARF), a non-profit organization devoted to making UW-Madison research discoveries available to the public.

The technology behind the eggs was assigned to WARF, which filed for a patent.

In turn, WARF licensed the technology to Century Acre Eggs, of which John Brunquell is one of five owners. They immediately applied it to the Century Acres business. Since starting the "eggstasy" line of low-fat and low-cholesterol eggs in 1994, Century Acres has sold more than 250,000 dozen eggs, developed exclusive markets in eight states, and started an international company that just formalized a contract with Japan.

"This wouldn't have happened without WARF," he says. "WARF can quickly move technology from the lab to the business world. Few communities can do that effectively."

As both discoverer and entrepreneur, Brunquell offers a fairly seamless example of how WARF can foster economic development in the state and beyond. With its ability to both patent and license discoveries stemming from UW-Madison research, WARF can make technologies available to industry that would otherwise remain undeveloped.

WARF director Richard Leazer says industry has been relying more than ever on universities as a research and development as a cost-effective way for businesses to stay competitive. In the pharmaceutical industry alone, 44 percent of new products have come from university research, he says.

"At most universities, if faculty members have a discovery with commercial potential, they usually don't have the money or the expertise to pursue a patent," Leazer says. "We have the money to invest in patents, and we also have an infrastructure of people who can make the contacts with industry."

ECONOMIC DEVELOPMENT

■ Whether it's a Door County orchard owner selecting new apple trees or a farmer picking corn, soybean, oat or alfalfa varieties, Wisconsin growers depend on the plant variety evaluations that College of Agricultural and Life Sciences scientists carry out each year. For example, a recent study showed that almost 60 percent of Wisconsin farmers depend primarily on these evaluations when selecting alfalfa varieties. By harvesting varieties that rank in the top 10 percent rather than varieties that produced an average yield, farmers earned an additional \$55 million in 1994.

■ The Wisconsin Center for Urban Land Economics Research at the School of Business has been involved in several real estate development issues as a part of its community service focus. The center, funded in part through real estate licensing fees and research grants, focuses on professional education and outreach to the public. Consulting projects have included working with a southside Madison neighborhood group to redevelop the area, developing strategic plans for the Hilldale Shopping Center and the University Research Park, advising Native American tribes on land use issues and helping the UW Arboretum find a long-sought buyer for a piece of commercially zoned land.

Leazer says 40 percent of the income-produced licenses WARF manages have gone to Wisconsin companies, which has been a significant boon to the state economy. The presence of WARF has also helped accelerate the growth of biotechnology companies in Dane County.

UW-Madison has a long and unique history of making these technology transfer connections work. WARF has been around since 1925, when pioneering UW dairy scientist Harry Steenbock made an important discovery in vitamin D irradiation processes, which could activate Vitamin D in milk and food products. In order to control the standards of this process, Steenbock sought a patent and put the wheels in motion for the creation of WARF.

Steenbock's Vitamin D irradiation process remains one of the greatest testament's to WARF's importance, and led to a complete conquest over once-common diseases such as rickets. Other discoveries protected by WARF patents include UW biologist Karl Paul Link's development in the 1950s of Warfarin, a breakthrough rodenticide that greatly controlled rat populations on farms. The same discovery led to lifesaving drugs that could adjust blood clotting in humans.

For the past three decades, UW biochemist Hector DeLuca's findings related to the medicinal potential of Vitamin D continue to have far-reaching benefits in fighting osteoporosis, chronic kidney disease, psoriasis, cancer and other diseases. DeLuca currently has 63 active U.S. patents and 299 foreign patents. Pharmaceutical companies have developed a number of successful

disease-fighting drugs from DeLuca's discoveries, and his patents are currently the top producer of royalties for WARF.

WARF royalties totaled nearly \$16 million in 1993 (the latest available yearly data), with income generated from 72 licenses, and it obtained 51 patents. That money is channeled back into the research enterprise at UW-Madison, ensuring a high standard of excellence in research and thus a new generation of discoveries.

■ Way beyond cheddar

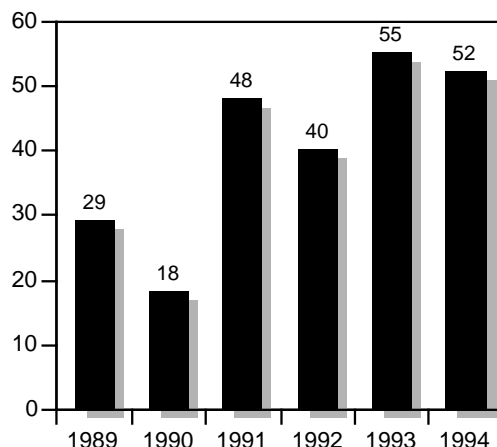
An amazing array of UW research benefits Wisconsin's milk producers and processors.

It seems only natural to form an alliance among UW-Madison dairy researchers, dairy farmers and cheese producers. But the extent to which research conducted at UW-Madison's Wisconsin Center for Dairy Research affects the state spans the Milky Way — from producing useful proteins by genetically improving the cow's udder to finding new uses for the whey that remains after cheesemaking.

Drawing on expertise from across the campus and around the world, the center carries out a multidisciplinary program to develop new uses for milk and milk components. Links with manufacturers are crucial and are a central focus for the center, according to director Rusty Bishop. In addition to the more than 150 publications and presentations in the past two years, the center sponsors up to 35 research projects a year:

- **Specialty cheeses profitable for small companies:** While Wisconsin will continue to

■ U.S. patents granted to WARF annually



Since its founding in 1925, the Wisconsin Alumni Research Foundation (WARF) has obtained 900 patents resulting in a gift of \$316 million to the university. This chart reflects the patents granted to WARF by the U.S. Patent and Trademark Office over the past six years.

■ In response to a concern expressed by a Wisconsin meat packer about keeping red meat red, animal scientists at the College of Agricultural and Life Sciences discovered that meat from steers fed extra vitamin E stayed fresh-looking up to five days longer in supermarket coolers. The meat will still turn from red to brown before harmful bacteria develop. If adopted nationwide, the practice could save the beef industry nearly \$1 billion annually.

■ Long-term research on ways to clean up Green Bay, Lake Michigan, by the UW Sea Grant Institute over the last 20 years, led to the Fox River-Green Bay system being selected by the United States Environmental Protection Agency for a landmark national study. The study identified sources, movement and the ultimate fate of a toxic contaminant (PCBs). UW-Madison scientists conducted research on essential parts of this five-year study, completed in 1993. The study's findings saved the state hundreds of millions of dollars in unnecessary clean-up costs that actually would have been counterproductive to reducing PCB-contamination.

■ Two researchers at the College of Agricultural and Life Sciences have found a way to reduce the amount of feed needed to grow animals. The researchers estimate that Wisconsin's poultry industry could save \$1 million each year in production costs, and foresee much larger savings for the cattle and swine industries.

produce Cheddar and other popular cheeses, import-type specialty cheeses have caught the fancy of U.S. consumers over the past 15 years. As the market changes, Wisconsin cheese makers with the help of UW-Madison dairy researchers are right there in the forefront, says Jim Path, a specialty cheese technologist at the center.

Researchers have developed and tested a variety of specialty cheeses, including Wisconsin-Style Havarti™ cheeses, and they are working with Chalet Cheese in Monroe to develop a new Port Salut-style cheese.

"You've got to look ahead or you'll be left in the cold," says Myron Olson, manager of Chalet Cheese, a cooperative wholly owned by the 35 farmers who supply its milk. Olson understands the potential of new cheeses. Thirteen years ago, Chalet Cheese didn't make any Baby Swiss; today, it accounts for about 75 percent of its production.

• **Doing away with whey — cleanly and profitably:** Wisconsin cheese factories churn out nearly 2 billion pounds of products a year. Those curds leave behind about 18 billion pounds of whey, and center researchers are developing new ways to use it. Food scientist Jim Steele is engineering bacteria from whey that produce only L-lactic acid, which can be converted into polylactide polymers. Polymers can be used to make photodegradable and biodegradable films, such as coatings for paper plates and milk cartons.

This research has been applied industrially at the ECOCHEM whey processing plant near Adell. The \$20-million facility converts the lactose in whey into lactic acid. The plant is connected by pipeline to the Adell Whey Co., which collects whey from cheese factories throughout east-central Wisconsin.

• **Cutting calories in cheddar cheese:** In today's health-conscious culture, many consumers want reduced-fat Cheddar cheese but they also want full Cheddar flavor. No problem — right? Wrong — drastically reducing the fat can result in bad-tasting stuff with the texture of library paste.

Reducing the fat in cheese by 25 percent is fairly simple, but cutting fat by 50 percent poses a challenge, says center senior scientist Mark Johnson. Johnson and his colleagues produced tasty reduced-fat cheese by selecting starter cultures and skipping the usual cold-water wash during manufacture.

• **No more hazy cheese:** Calcium lactate, a harmless white haze, sometimes forms on Cheddar-type cheeses. The haze won't harm people or cheese flavor, but hazy cheese doesn't sell. Cheese that shoppers reject gets sold for salvage, with an annual loss to the Wisconsin dairy industry that may total nearly \$6 million.

Under the direction of Norm Olson, the former director of the center, researchers developed low-cost ways to eliminate haze. In addition, they developed an early warning system that tells packagers if the cheese is likely to develop the haze. Cheese that triggers a warning can be shipped directly to processors that make cheese spreads and other products.

■ Engineers save Madison ratepayers millions

Students and faculty develop a better way for the Madison Metropolitan Sewerage District to solve an expensive problem.

A 1997 deadline to cut discharges of phosphorus into surface waters posed an expensive problem for the Madison Metropolitan Sewerage District — and the 270,000 people it serves. The new requirement threatened to cost a tanker-full — \$54 million over 20 years.

Following a tradition that dates to the early 1970s, the district asked UW-Madison engineers to help solve the problem. The solution they developed will save millions of dollars for ratepayers, while still protecting the environment.

The Wisconsin Department of Natural Resources (DNR) imposed the deadline to prevent phosphorous from feeding algae in streams and rivers. The sewerage district proposed an alternative to the DNR's chemical method of phosphorous removal: using biological techniques in the treatment plant. Two graduate students from UW-Madison's Department of Civil and Environmental Engineering built a pilot plant that introduced a bacteria to consume the phosphorous.

Wayne Karlovich of Muskego, Wis., and Todd Rubens of Yakima, Wash., students of Professor William Boyle, ran the pilot plant for almost a year. The data they produced was impressive enough to earn them master's degrees. It also convinced the DNR that biological removal would work, so the

ECONOMIC DEVELOPMENT

■ The Bureau of Business Research at the School of Business issues long-range economic forecast studies for Wisconsin, including the recent publication of "Wisconsin's Economy in the Year 2000." These studies help industry and government officials plan for the economic future of the state.

■ A comprehensive program to manage potatoes is a national model for growing crops with minimal chemicals. Developed by a College of Agricultural and Life Sciences team, the program saves Midwestern potato growers nearly \$1 million each year in pesticide and irrigation costs while improving environmental quality.

■ The Enterprise Center of the School of Business encourages entrepreneurial activity in Wisconsin, including management training to the Ho-Chunk Nation.

■ A potato cultivar named Snowden, developed by a geneticist and breeder at the College of Agricultural and Life Sciences, has brought the potato chip industry back to Wisconsin. Since Snowden was released in 1990, the nation's two largest potato chip manufacturers have been shifting potato contracts to Wisconsin's Central Sands. One Wisconsin grower reports his sales went from \$180,000 to \$9.5 million in four years, all due to Snowden.

department issued a variance allowing the technique.

"The UW study was critical in getting that variance — we would not have gotten it without the pilot project data," says Jim Nemke, the Madison Metropolitan Sewerage District's chief engineer.

The removal the students engineered will be less expensive — about \$19 million over 20 years for modifying aeration tanks so bacteria will eat the phosphorous. So the sewerage district's \$60,000 investment in graduate students will save \$35 million in present-value dollars. In addition, the district won't need to add 7,000 pounds of alum to its waste stream daily. The benefits extend beyond Madison, since other wastewater dischargers in Wisconsin can now use biological phosphorous removal.

"Originally, the DNR was uncomfortable with biological treatment," Nemke says. "They've taken a 180-degree change — now they're encouraging every plant in the state to look at biological removal of phosphorus first."

Nemke says the district has spent \$660,000 on UW-Madison research since 1973 for a simple reason: it's effective. "We get high-grade examination of problems, with high-grade supervision by UW-Madison professors."

For the college, the relationship has been equally gratifying, says Professor P. Mac Berthouex of the Civil and Environmental Engineering department. In the course of funding 40 master's and six doctoral degrees, the district has given students irreplaceable experience in the real world. "Almost all of the research was used to make decisions," Berthouex says.

■ Center counsels small business entrepreneurs

Working with individual businesses, the Small Business Development Center improves the community's economic health.

Small businesses may represent the economic hope for the nation's future, according to economic analysts. National statistics show that the small business sector leads the economy in terms of job growth and innovation.

At UW-Madison's Small Business Development Center, business counselors are

fostering this growth by providing expertise, advice and financial guidance.

And for some, the center is making hopes of owning one's own business a reality, as was the case for Nan Thepboriruk who says Small Business Development Center classes helped make her "dream come true" when she opened Sukho Thai Restaurant and Food Center on the UW-Madison campus.

The business development center, located in the School of Business' Grainger Hall, serves a five-county area in and around Madison. This award-winning agency is part of a national Small Business Development Center network.

The agency works with small and medium-sized businesses including manufacturers, high technology professionals, and service and retail operations. They begin with the basics, even offering classes that help people decide whether they should go into business at all. If it's a go, the center staff gets them off to a good start with the business plan, marketing concepts and financial projections. UW-Madison counseling services work with existing businesses to improve marketing, operations, human resources and financial management.

Last year, the center worked with more than 170 businesses on a one-to-one basis, taught over 2,000 individuals in 70 classes and helped more than 1,900 people through its phone information Access Line and database service.

In some cases, the staff works with professionals on sophisticated turnarounds. Take the case of Jim Billian, who took over the Simon Corporation in 1993 after retiring from Hughes Aircraft. The center offered help by bringing marketing and management training to the corporation's 60 employees.

Or, it can help solve problems by linking clients to the university's resources, as was the situation when a Wisconsin play equipment manufacturer needed engineering counseling on the most efficient way to enlarge its plant, or a company needed a Wisconsin machine re-engineered to blanch and cook almonds.

"We are always looking for ways to improve our service to our clients," says Joan Gillman, who has directed the Small Business Development Center for the past seven years. "One of important measures of a community's health is its business climate. We feel that by contributing to success of individual businesses, we are helping create and sustain a more stable and healthy economic climate."

III PROVIDING EXPERTISE

SHARING INDIVIDUAL AND COLLECTIVE KNOWLEDGE FOR THE BETTERMENT OF WISCONSIN

■ With over 16,000 pieces in its permanent collection dating from the 22nd B.C. to the present, the Elvehjem Museum of Art provides a valuable arts resource. The museum serves over 100,000 visitors each year through visits, tours, lectures and educational programs.

■ The School of Business has established the Women in Business Council, which is now working with the Wisconsin Glass Ceiling Commission — the first such commission in the nation — to increase the numbers of women and minorities on the boards of directors of businesses, non-profit organizations and government agencies. The council is creating a database for those interested in board service.

■ The Drug Information and Poison Control Center, staffed by registered pharmacists at the UW Hospital 24 hours a day, handled nearly 33,000 calls in 1994 from throughout Wisconsin and the region. One of only two Wisconsin sites, the hospital's poison control center works to help prevent and treat thousands of accidental poisonings.

■ The UW Hospital and the UW Comprehensive Cancer Center serve as a regional information center for residents of Wisconsin and the region. Counselors at the Cancer Information Service helped 14,000 callers — mostly from Wisconsin — since January 1994.

■ Training and support materials for Library Advocacy Now, a grassroots campaign to increase awareness and support for the nation's libraries sponsored by the American Library Association, were developed by the School of Library and Information Studies Outreach Program. Training sessions with the materials will be held in almost every state.

■ The University of Wisconsin Press publishes many books written by Wisconsin authors or that feature Wisconsin, helping to preserve the state's heritage and increase awareness of Wisconsin issues.

■ Serving as good citizens: Faculty, staff and students share their time, expertise

UW-Madison is bringing new meaning to the word "community."

In addition to their roles as teachers and researchers on campus, each year hundreds of UW-Madison faculty and staff make significant commitments of their time to perform public service activities for the community beyond the campus.

In a recent survey on public service, for example, more than 800 faculty and staff have reported a multi-faceted tapestry of services and projects in which they shared their particular expertise with governmental bodies, industry and citizens in Wisconsin and throughout the world.

Responses to the survey, which focused only on activities faculty and staff performed in their field of expertise, included such activities as advising a U.S. senator on Supreme Court nominations, briefing the Wisconsin legislature on census figures, presenting demographic assessments of growth trends for local communities, teaching seminars at state conferences of cranberry and apple growers, and giving addresses before dozens of civic or professional groups.

Associate Vice Chancellor Joe Corry, whose office encourages the development of outreach activities among faculty and staff, says the survey highlights an important commitment to reach out to the state. "This university provides a rich resource to Wisconsin and the nation, and an excellent way to tell that story is through the individual commitments of our faculty and staff," he says.

Such expertise can often fill a niche for the needs of non-profit organizations, policy makers and citizens of the state. Take the case of Jeanine Mount, associate professor in the School of Pharmacy. Mount studies the quality of nursing home facilities in Wisconsin, and specifically, the over-use of drugs for sedating and restraining residents.

"Chemical restraints in nursing homes can be worse than physical restraints," she says. "Physical restraints can be removed, but it may take days for the body to rid itself of

the drugs. As they are used, these drugs often have no therapeutic value, but over-use is a very common occurrence, even though studies have shown they don't have the controlling effect wanted."

Recognizing the need for better information about this problem, the federal government did an extensive study in the late 1980s on whether it could conduct research on drug use in nursing homes, but found the problem too complex to undertake. Instead, it turned to researchers like Mount and Professor Bonnie Svarstad at UW-Madison's School of Pharmacy for the knowledge it needed.

"There are a lot of the common-sense notions about nursing facilities that have been held by the public and by government officials," says Mount, who has both a professional degree in pharmacy and a doctoral degree in organizational sociology. "When we conduct scientific studies, many of those notions turn out not to be accurate. Nursing home quality-of-care issues, and quality of drug use in particular, are far more complicated than we often think. In only a few places, like UW-Madison's School of Pharmacy, is there the critical mass of researchers needed for these kinds of complex studies."

When it came time to revise and implement regulations of drug use, Mount testified before the U.S. Senate's Special Committee on Aging. Mount's public service activities continue: She and Svarstad now are conducting follow-up studies in Wisconsin on the longer-term impact of those policies.

■ Clinics care for poor, uninsured citizens

Students design a creative solution to affordable, accessible medical care.

On Saturday mornings, it's not unusual to see a half dozen people waiting patiently for the doors of the South Side MEDIC Clinic to open. Like its sister clinics at Grace Episcopal Church's shelter for homeless men and the Salvation Army homeless shelter, the facility offers free medical care to Madison's poor, uninsured and underserved citizens.

The clinics are the outgrowth of the MEDIC organization, a program created in 1990 by UW Medical School students inspired by a desire to help people who ordinarily do not have access to basic health care. Today

PROVIDING EXPERTISE

■ Some 125 family practice residents from the Medical School and over 70 faculty provide primary healthcare for over 70,000 people in nine clinics located in Appleton, Eau Claire, greater Madison, Milwaukee and Wausau. In addition, through a growing number of community partnerships, the residents and faculty provide access to medical care for Wisconsin's underserved and special population such as the homeless, elderly, cross cultural groups, prisoners and rural populations all over the state.

■ The La Follette Institute of Public Affairs offers a wide range of programs and publications for government officials. For example, this past year, the Institute held a seminar for 50 local government officials on mandates and a leadership institute for 35 legislators in 11 states from both parties.

■ The Multicolored Mirror Institute for Writers and Artists, provided through the School of Library and Information Studies, brought together unpublished writers and artists with those who have already published in an effort to increase the number of books for children and young adults created by people of color.

■ Students earning master's degrees in arts administration work as project assistants with local arts organizations, providing expertise to these groups. Students play major roles in marketing, fundraising and management of organizations such as the Madison Civic Center and the Wisconsin Arts Board.

■ Cabinet 99, created by the Wisconsin Alumni Association to involve more women in leadership positions in the state and around the nation, provides mentoring programs and continuing education seminars to help women become leaders in the work force and in their communities.



Earthwatch, an award-winning radio show produced by the UW Sea Grant Institute and the UW-Madison Institute for Environmental Studies, has provided science and environmental news reports and contributed to science literacy for some 23 years. Programs are distributed free to about 150 public and commercial radio stations throughout the Great Lakes region. The potential audience is projected to be two million listeners.

physician volunteers and student helpers at the three clinics offer at least 12 hours of free care each week.

For patients suffering from bronchitis, flu, ear infections, hernias, diabetes and other common ailments, the clinics provide sorely needed services. Between eight and 12 patients are seen at each of the three clinics weekly, translating to care for more than 1,500 people yearly. Many of the patients also are directed to other social agencies where they can find help for different kinds of problems.

For medical students and, more recently, nursing, pharmacy and health administration students, the clinics provide a chance to learn clinical skills and observe close-up the challenges of life at the poverty level.

"It was my first hands-on experience in a clinical setting," says Clark Kulig, a second-year medical student. Students interview and examine patients before physicians, who are members of the Medical School faculty and community volunteers, establish a diagnosis and suggest a treatment or referral plan.

The clinics capture the essence of primary care medicine — frontline care that focuses on healing illnesses that afflict most of us. "Working at the south side clinic gave me a good perspective on what it's like to spend time with patients and see them through their problems," says Kulig. "I now know that primary care is the way to go for me."

A council of MEDIC student leaders directs organization of the clinics, including scheduling staffers and ordering supplies. Approximately 200 student volunteers staff the clinics each year.

■ Students reach out beyond the campus

Volunteer work puts students in touch with diverse communities.

This March, some 90 students passed on the chance for a beach-side spring break and instead traveled to seven U.S. locations for a week of community service and learning opportunities as part of the Wisconsin Union Directorate Alternative Breaks Program.

Student volunteers visited and worked with communities as diverse as the homeless in Washington, D.C., an adult day care center in the mountains of Franklin, N.C., and an American Indian reservation freedom school in upstate New York.

Sponsored by Wisconsin Union Directorate student volunteers and the Wisconsin Union Travel Center, Alternative Breaks gives UW students a chance to experience racially and economically diverse populations, to become part of a community and culture that is very different from their own. Since its inception five years ago, hundreds of students have volunteered time to work for organizations such as Habitat for Humanity in New Orleans and Miami, the United Farm Workers in San Juan, Texas, and Martha's Table Soup Kitchen in Washington, D.C.

In another example of student service, at Volunteer Placement Day, held in both fall and spring semester, more than 800 students volunteer for non-profit organizations; some 2,500 contacts are made.

At the School of Business, all MBA students volunteer at homeless shelters and

PROVIDING EXPERTISE

■ Faculty, staff and students in the schools of Music and Education volunteer for the Madison Bootstraps Program, an after-school program for at-risk students in grades six-12. Tutoring sessions are provided in areas such as math, languages and music.

■ Each year graduate students, under the supervision of UW-Madison faculty and staff, conduct an in-depth study of an actual public water-management problem, formulate recommendations and provide low-cost management plans as a part of the Institute for Environmental Studies' Water Resources Management Workshop.

■ Several of the Wisconsin Alumni Association's 115 alumni clubs have also begun community service initiatives such as the Chicago Club's innovative "Adopt a School" program. The Wisconsin Alumni Volunteer Endeavor (WAVE) annually brings together volunteers from both town and gown sectors to benefit the Madison community.

■ Expanding Visions in the Arts provides art workshops for people who are unlikely to enroll in traditional university classes, such as teenagers in an alternative school, adult survivors of abuse and low-income children. UW-Madison students and local artists spend several hours a week at community agencies, providing workshops tailored to their students' needs.

■ Geography faculty in the College of Letters and Science are working to create a cartographic profile of Wisconsin in order to represent the state's cultural heritage. The "Cultural Map of Wisconsin," which is intended to be a companion to the state highway map, will feature ethnic settlements, historic sites and important buildings. Nine public forums were held around the state to gather input from Wisconsin residents.

low-income neighborhood community centers in Madison as part of a required course in "The Political, Ethical and Legal Environment of Business." Students work one-on-one with those who have low incomes and devise strategies to improve organizations serving the homeless and working poor.

■ WINGS tackles health issues on reservations

Statewide public service program focuses on Native American children with special health care needs.

The mixture of poor access to health care, rural conditions and stereotypes about Native Americans has had its negative effects on children who live on the 11 reservations in Wisconsin and have special health care needs.

Countering these difficulties, the Wisconsin Indian Network for Genetic Services (WINGS) focuses on serving the often ignored health care issues of Native American children. The program, created by UW-Madison Medical Genetics Professor Raymond Kessel, provides diagnostic clinics for children and their families. The clinics have been conducted at nine of the state's 11 reservations.

"The spirit of the Wisconsin Idea is to find ways of using the experience and talents of the great research and teaching university to address specific needs of Wisconsin — not only at the university but in the local communities," Kessel says. "My challenge is in helping to build the bridge to the community by identifying the needs, and then by identifying members of the university community to help meet those needs."

In the first day-long clinics sponsored by WINGS, staff got impressions of how underserved and misrepresented these groups were. Kessel says they were told up to half of the children who had mental or behavioral problems were diagnosed with fetal alcohol syndrome. But of the more than 250 children treated at clinics since 1986, Kessel says staff confirmed only a few cases of the condition. Many, he says, often have other conditions not related to perinatal exposure to alcohol.

It was an example, he says, of how stereotypes about Native Americans and

poor access to quality health care had to be countered by their program. "A lot of factors that contribute to kids having special needs were not being considered," he says. Those include a high poverty rate, poor nutrition and geographic isolation from everything — including doctors and telephones, making accurate and complete diagnoses difficult to obtain.

"Kids with problems were being ignored," Kessel says. "Many of these kids had been identified with medical and emotional problems, but there was no accurate diagnostic assessment and no follow-up."

WINGS is part of a larger genetics outreach program, which focuses on clinical services and genetics education as part of a statewide genetics services network. Last year physicians and genetics counselors addressed more than 130 groups — ranging from K-12 students to college students, from physicians to public administrators — in an effort to increase awareness and understanding about children with special needs.

Kessel credits the program's success to Tribal Coordinator Arvina Thayer and Project Coordinator Karen Martin, both members of the Ho-Chunk Nation who worked to gain trust and develop local ownership of the project, and to faculty and staff of the UW Clinical Genetics Program who are willing to travel to the tribal communities.

This spring, WINGS received the annual Maternal and Child Health Achievement Award from the Wisconsin Maternal and Child Health Coalition for outreach to minority, low-income and other hard-to-reach populations.

■ La Follette helps new legislators get up to speed

Seminars provide a primer on public policy issues and decision-making.

They have their parking assignments. They know how to apply for per diem allowances. They have been briefed on the state's ethics guidelines. They are learning to find their offices. And they have hired most of their staff.

So the new state legislators, sworn into office just a few days earlier, are eager to get to the real issues as they gather on a cold January day for the biennial La Follette Institute Seminar for New Legislators.

PROVIDING EXPERTISE

■ The Arts Outreach Program provides cultural service through music education and performance. The program participated in 18 concerts with a combined audience of 3,914. School of Music faculty provided 28 music clinics, school performances and master classes reaching some 2,283 Wisconsin high school students in the 1993-94 academic year.

■ More than 220 students from the School of Social Work provide expertise and specialized knowledge through internships with human service agencies in Dane County and throughout the state. The students, who earn academic credit rather than a salary, work some 16-20 hours per week for one to two years in areas such as mental health, child welfare, aging, health care and education.

■ Parenting the First Year, a program through the School of Family Resources and Consumer Sciences, publishes a free monthly newsletter in English and Spanish that reaches some 50,000 Wisconsin parents during their baby's first year. The publication has been picked up by 15 other states as well. The eight-page newsletter offers easy-to-read information on topics such as health, safety, feeding, child guidance, infant temperament and psychological development.

■ The university makes its expertise available throughout the year by publishing a speakers directory of over 650 faculty and staff willing to talk to community organizations and schools. News media from throughout Wisconsin and the nation receive the Experts List, which makes available the expertise of 1,150 members of the faculty and staff willing to be interviewed by reporters.

■ Some 25,000 visitors toured the Geology Museum last year, including more than 10,000 school children from southern Wisconsin. The museum covers all aspects of geology including a 6-foot-diameter rotating globe, a walk-through model of a limestone cave, minerals, rocks and fossils. Museum highlights include dinosaur skeletons and a Wisconsin mastodon.

There are about a dozen in the class of 1995-97: Republicans and Democrats, men and women, senators and representatives. Like other legislators before them, they are beneficiaries of the teaching, research and outreach components of the La Follette Institute. This year's seminar topics included government reinvention, the Wisconsin economy and economic development.

In a letter sent last fall to the newly elected legislators, Assembly Speaker David Prosser stressed the importance of the seminar for new legislators: "The seminar is one of a number of very useful programs for state policymakers that the La Follette Institute has developed. Participation ... will speed your transition into the legislative role and you will have an excellent opportunity to reflect upon the challenges of the policy making process itself."

Since its establishment by the Legislature in 1984 in the rich tradition of "Fighting Bob" La Follette, the Institute has served thousands of students, public officials, business people, non-profit sector professionals, academicians and citizens in learning to apply sound management principles and tools of policy analysis to public issues.

The seminar is just one of the ways La Follette's faculty and staff have made the Wisconsin Idea come alive for all levels of government through special activities and publications related to issues such as leadership, welfare reform, urban fiscal issues, education policy, governance, corrections, health care and public management.

■ Sports Medicine program assists young athletes

Hundreds at Wisconsin high schools and colleges benefit from knowledge of UW Hospital Sports Medicine certified athletic trainers.

About five minutes into a hotly contested high school soccer game, 16-year-old Lori Gunderson felt a "pop" in her knee and the sensation of water flowing inside her leg from the kneecap to her ankle.

UW athletic trainer Joe Greene, who was covering the game for Madison Memorial High School, had seen the same thing happen to other athletes. He met Gunderson at the bench, quickly evaluated the injury

and urged her not to return to the game until a physician could examine the knee.

Gunderson later learned from UW Hospital physicians that she had completely torn her anterior cruciate ligament (ACL), one of four major ligaments that connect the larger bone in the lower leg (the tibia) to the thigh bone (femur). Following two weeks of intensive, exercise therapy, she underwent surgery to reconstruct the ligament and then began daily rehabilitation, under Greene's guidance, to recondition the injured knee.

"If it wasn't for Joe, I don't think my knee would have turned out so well," Gunderson says. "I would recommend him to anyone."

Hundreds of Wisconsin athletes like Gunderson benefit from the athletic training outreach program offered by the UW Hospital Sports Medicine Center. Established in 1982, the program places certified athletic trainers in more than 30 high schools and several colleges, and has served as a model for other programs around the state.

"Between 60 and 70 percent of high school students participate in some athletic activities," notes Dan Campbell, who heads the outreach program. "That means the majority of high school students are at risk for injury. We see ourselves as educators — for coaches and parents as well as students — and I think our services are highly appreciated."

The trainers play several roles: helping prevent injuries through proper conditioning and training; handling emergencies on site as well as making the appropriate recommendations for physician follow-up; and completing the circle with rehabilitation to return injured athletes to full functioning.

They also provide expert guidance on nutrition, drug abuse and general health. The exercise science lab at the Sports Medicine Center works closely with the athletic trainer program to provide young athletes with better ways to train and to recover from injuries.

The various components of the program worked well for Gunderson, who returned to competition for her final two years of high school and competed in the state tournament her senior year. Now in college, she plans a health-related career where she, too, can help young people make the most of their athletic talent.

IV IN PARTNERSHIP WITH SCHOOLS

INVESTING IN THE FUTURE OF WISCONSIN CHILDREN THROUGH EDUCATIONAL COLLABORATIONS WITH SCHOOLS

■ All the schools and colleges on the UW-Madison campus offer at least one partnership with Wisconsin schools. In 1994, UW-Madison partnerships to Wisconsin schools included more than 54 precollege programs serving over 11,000 students; over 40 staff development programs serving hundreds of teachers, staff and administrators; and art, geology, physics, space and arboretum tours serving over 30,000 Wisconsin students per year.

■ Each summer, high school students and teachers participate in the daily work of Earth and atmospheric scientists through a workshop coordinated by the Cooperative Institute for Meteorological Satellite Studies. Participants work with those scientists as well as some at the Institute for Environmental Studies and in the Departments of Geology and Geophysics and Atmospheric and Oceanic Sciences.

■ The Center for Biology Education coordinates a six-week summer program for minority high school students that focuses on science.

■ Through its Satellite Technology Education Program, the Space Science and Engineering Center and its Cooperative Institute provide McIDAS, a system which displays and analyzes the Earth's weather patterns, to Wisconsin high schools. The new Watertown high school and Madison's Edgewood High School have systems in place now. High schools in Appleton and Verona will soon join as well.

■ The Madison Education Extension Programs conducts about 100 workshops and institutes held for 1,800 teachers, school administrators and parents, providing the latest information on a variety of topics, such as conflict resolution, multicultural storytelling and environmental education.

■ Program puts new face on mathematics education

A math program takes a new approach to teaching based upon research done at UW-Madison's School of Education.

In schools all over Wisconsin, children are learning faster than their teachers ever thought they could. And they're more motivated and confident, teachers report.

The reason is Cognitively Guided Instruction, which was developed after years of research by School of Education Professors Thomas Carpenter and Elizabeth Fennema and sponsored by the National Science Foundation. The program adopts an innovative approach to teaching mathematics.

It encourages elementary-school teachers to take what their students already know about mathematics — and then build on that foundation. The program focuses on problem solving, giving children the chance to solve interesting mathematical problems rather than drilling them.

"It teaches them to be problem solvers, not calculators," says Dyanne Van Den Heuvel, a second grade teacher at Northwoods Elementary School in Eau Claire who now teaches workshops on the program to teachers from around the state.

Math problems in the curriculum focus on "story" or word problems that are made relevant to students' lives and can be approached from a variety of strategies that children have already developed by the time they enter school.

The central philosophy behind the program stems from Carpenter's research conducted over 15 years on how children think and how teachers learn to teach. "His research showed quite clearly that children come to school with many, many skills," explains Fennema, who developed the program with Carpenter. "But school math curriculums don't build on that knowledge, and in some cases even wipes it out."

What Cognitively Guided Instruction does, says Fennema, is help teachers understand what knowledge children bring and what problem solving skills they have in order to build on those. The key, says Van Den Heuvel, is that "instead of the teacher telling one way to solve a problem, children discover methods that work for them. And it

has allowed me to understand my children's thinking and then know what are the appropriate next steps in helping them learn."

The results of the program have been striking. Students taught from this new approach outperform their peers who learn by more traditional methods; and they seem to be more enthusiastic about the subject, too. Says Van Den Heuvel, "I'm really excited about the program because it changes how you teach and how you can facilitate children's learning. It has taught me about how children think and about how I as a teacher can help them grow as learners. This is powerful information for me and teachers all throughout the state."

The news has spread rapidly, and teachers in all corners of the state are incorporating the approach into their classrooms. In the past five years, workshops on the program have been offered in at least 27 different Wisconsin locations, from Beloit to Ashwaubenon to the Oneida Tribal School. The Madison school district has a professional position devoted to helping teachers implement the program.

"I've seen lots of things come and go in my 22 years of teaching," Van Den Heuvel says. "After eight years of teaching with CGI, I'm just as enthusiastic about it as when I started with it. And I learn math from my students on a daily basis."

■ Workshop teaches enthusiasm for science

The Teacher Enhancement Program brings teachers to campus to learn the latest in scientific breakthroughs.

Michael Anstett, who has been a high school biology teacher in Omro, Wis., for 23 years, says he has never been more enthused about his job than in the last few years.

He gives the UW-Madison Teacher Enhancement Program in Biology much of the credit. "The program helped me be more enthusiastic and more comfortable in the classroom," he says. "Not only were the classes excellent, but I got to visit with other teachers to compare problems and concerns."

Anstett is one of more than 300 elementary and high school teachers from around the nation who visited the Madison campus this summer to study strategies for teaching science. Teachers enroll in up to four of the more than 30 one-to-two-week modules

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■ The Center on Education and Work is helping people become better prepared for the work force. As one of the oldest and largest centers of its kind, it is at the forefront of a national movement to improve vocational training and career development services. Each year some 350,000 Wisconsin residents use the center's Wisconsin Career Information System, which provides access to career information through state-of-the-art software and other materials.

■ UW-Madison has established the National Institute for Science Education in a partnership with the National Science Foundation and the National Center for Improving Science Education. The one-of-a-kind institute, funded at \$2 million a year over five years, will be the nation's premier center of research and development on issues of science, math and engineering education.

■ The newly created BioNET, a statewide sharing network for biology education teachers, brings researchers from universities and industries together with biology teachers.

■ Raising Responsible Teens, a program offered through the UW Hospital, presents a series of seminars to parents and healthcare professionals who work with teens. The program has reached more than 7,200 parents of Wisconsin teens, offering information about topics such as alcohol and drug abuse, depression and suicide, sexuality and teen pregnancy.

■ The Institute for Multicultural Science Education, a two-year program for teachers from Madison and Milwaukee schools, provides 400 hours of training on restructuring the science curriculum for culturally diverse students.



Providing curriculum training nationwide, Wisconsin Fast Plants has trained more than 35,000 grade school and high school teachers to use this unique teaching program. The program focuses on an organism whose life cycle is short enough to fit neatly into a teaching unit. In 1994 alone, some two million students used fast plants to learn about subjects such as physiology, genetics and ecology — the fundamentals of biology.

offered in fields such as human genetics; molecular and cell biology; plant, animal and environmental biology; and elementary science. Teachers earn one or two university credits per module.

The summer biology program is part of a larger teacher enhancement program which involves presenting workshops and programs throughout the academic year and developing curriculum for teachers.

UW-Madison Professor Raymond Kessel, the originator of the 10-year-old biology program and its director, says classes emphasize an inquiry-based, problem-solving approach to science. "Since most elementary teachers had little, if any, science in college, we want to give them some hands-on methods of teaching science so they can go back to their classroom with the tools and

the enthusiasm for teaching," Kessel says.

Ann Bauman, an elementary school teacher from Janesville, says she had only one introduction to science in college. In the three years she has attended the program, she has studied genetics, the social implications of genetics, science for head start, preschool and primary grades, and cultural diversity in families of children with special needs. In addition to her new knowledge of science, Bauman says she has learned to integrate science into the whole curriculum and make it more of a hands-on experience.

For high school teachers, Kessel says the biology program is designed to update them on the latest information in particular fields and give them some new ideas to make the classroom more exciting.

Instructors for the biology classes come primarily from the science departments on the Madison campus. Most modules also have lead teachers who help plan the class and assist the instructor. Anstett, for example, helped to lead the DNA module this summer.

Kessel hopes all teachers who attend the biology program will in turn "trigger an interest in science within their own students, making them better prepared and willing to tackle science classes in college and consider careers in the sciences."

■ UW Space Place brings space down to earth

College of Letters and Science program offers hands-on learning for school children.

In March, when the Space Shuttle Endeavour made its longest shuttle flight ever, not only was a UW-Madison-built telescope aboard, but school children at UW-Madison's Space Place were beamed right into the center of the action.

Using a new videoconferencing system, the team of 30 Wisconsin scientists, engineers and technicians at the control center in Huntsville, Ala., communicated directly with school groups visiting the Space Place, explained the mission, answered questions and discussed what they saw in space. The students had a direct link to understanding the findings of the unique telescope, known as the Wisconsin Ultraviolet Photo-Polarimeter Experiment (WUPPE for short), and other NASA activities.

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■ Working to improve the teaching of science in K-12 schools throughout Wisconsin and the nation, the Institute for Chemical Education (ICE) provides publications for teachers on topics such as acid rain, the ozone hole and how to include science in elementary schools. Some 75 teachers and 150 middle school students attended chemistry education programs on campus this summer. ICE is also working on a major effort to revamp the nation's college chemistry curriculum through a nation-wide program funded by the National Science Foundation.

■ The UW Athletic Department holds annual clinics and sports camps, with more than 2,400 high school coaches attending this year.

■ The Institute for Chemical Education (ICE) has helped to develop a low-cost, easy-to-use kit that gives science and engineering students a three-dimensional handle on extended atomic structures of materials as diverse as table salt and semiconductors. The kits help students connect chemistry with common and high-tech materials.

■ The Instructional Materials Center makes its collection of 53,000 volumes available to educators and school librarians. Many educators use the library to read new school textbooks, examine testing materials and try out the latest instructional software before purchasing the items for their schools. The center offers workshops on using databases and Internet resources in education for educators.

■ College Access, a program offered in the summer through the School of Education, helps introduce teenagers of color to opportunities available on a university campus, improves their academic skills with individualized tutoring in math and writing, and encourages exploration of career goals.

This workshop is just one of the many activities offered at the Space Place, located at 1605 S. Park St. in Madison, for school children and teachers who visit from around the state, including Green Bay, Milwaukee, Madison and its surrounding areas.

Run by the Space Astronomy Laboratory by largely volunteer faculty and staff, the UW Space Place provides hands-on activities and informative lectures, as well as workshops and programs for more than 5,000 teachers, parents and children, and the general public in each of the past two years.

Opened in 1990, Space Place allows community citizens to learn basic scientific principles in fun and exciting ways, and gives teachers the latest resources for teaching math and science, says Kathy J. Stittleburg, assistant director of UW-Madison's Space Astronomy Lab and Space Place founder. "We've been able to use space as a hook to teach students about basic math and science knowledge," she says.

Recently remodeled, the Space Place now houses the prototype of the Orbiting Astronomical Observatory, the first astronomical orbiting satellite in space. Hands-on activities such as a grease-spot photometer, polarization exhibit and spectra display are located in the exhibit hall, along with a full-size mock-up of the aft-flight deck of the shuttle and a Hubble Space Telescope exhibit.

In addition, Stittleburg is now setting up a Space Place World Wide Web home page that will include information for teachers, such as resource materials from NASA. "We want to take those activities that are tried

and true and put them on the Web page as a way of reaching out beyond Madison," says Stittleburg.

The center has recently hired a half-time outreach specialist funded by NASA. "With the support of the College of Letters and Science, we've been able to start new projects and increase the number of school visits," she says.

■ Students learn hands-on prairie restoration, science

The Earth Partnership Program forms partnership with schools, Arboretum and the land while rebuilding Wisconsin's ecological resources.

The "land ethic" conservationist Aldo Leopold promoted 50 years ago is alive and thriving today in the back lots of Wisconsin schools, where students are turning barren fields into lush Wisconsin prairie.

The Earth Partnership Program, offered by the UW-Madison Arboretum, helps state teachers develop prairie restoration programs that give students firsthand lessons about the land, wildlife and the human obligations to protect them.

Dennis Panicucci, a science teacher at Central Middle School in Hartford, Wis., says the program has taught him and his students the basic knowledge needed to nudge a prairie to life. "We found out there was a heck of a lot of stuff we didn't know," says Panicucci, whose school is working on creating a restored prairie on a 53-acre outdoor lab students have dubbed "The Wildcat Habitat Preserve," named after the school mascot.



The Earth Partnership Program, funded by a \$485,000 grant from the National Science Foundation, helps Wisconsin teachers develop prairie restoration programs that allow students to "adopt" a prairie and learn firsthand lessons about the land, wildlife and the human obligations to protect them. So far, more than 100 teachers in 50 Wisconsin school districts have taken part.

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■ The School of Journalism and Mass Communication in 1994 developed ONLINE WISCONSIN, a multimedia news journal that merges audio, video, graphics and print media into a single information source and is available on the World Wide Web. The Journalism School is exploring partnerships with public schools to introduce students to new forms of online communication and news distribution beyond the traditional newspaper.

■ The Multifunctional Resource Center for Bilingual Education provides training on how to teach students who have limited proficiency in English. The center, which conducts hundreds of workshops that have reached thousands of educators and parents, prepares teachers to create classrooms that are open to students from a range of cultures.

■ Nine programs devoted to the study of world regions provide speakers and performers for K-12 schools to educate students about the changing global community. For example, language faculty have undertaken initiatives to promote the study of Japanese, Russian and Swahili in Wisconsin schools. The area programs also offer summer workshops and maintain resource collections for use by K-12 teachers.

■ High school teachers can participate in a series of summer seminars on teaching advanced placement (AP) courses. Experienced high school AP teachers join UW-Madison faculty to team-teach each seminar.

Through the program, they are learning how to identify different plants, how to analyze the soils that provide the best atmosphere for prairie plants, and how to conduct controlled burns that will insure regeneration.

The program, now in its fifth year, provides not only instruction to get schools started, but curriculum plans on how to integrate science, ecology, history, art and other subjects into the field work.

So far, more than 100 teachers in 50 Wisconsin school districts have taken part in the workshop. The schools need to have a commitment of at least six teachers to adopt the prairie in the lesson plans, spanning different age groups and disciplines. In total, more than 400 teachers will participate in some aspect of the program.

The program, run by a \$485,000 grant from the National Science Foundation, also brings students to the Arboretum for special tours and programs. More than 1,500 Earth Partnership students so far have been out to study the Arboretum's mature prairies.

Cheryl Haberman, an educator in the Earth Partnership Program, says a prairie can serve as an educational tool on many levels. As a complete ecosystem of plants, animals and insects, "a prairie brings out all the complex dimensions of human interaction with their environment," she says.

Students also develop a greater attachment to the ecology of the state through this program. Prior to settlement, the state had 2.2 million acres of original prairie spanning the state. Today, less than one-tenth of 1 percent of that prairie remains. More than a hands-on science project, the prairie can become an enduring resource to the school and the community, she says.

■ Upward Bound guides students to college

More than 100 precollege programs introduce children and teens to campus.

Making the transition to college life isn't always easy. That's why for thousands of K-12 students, the opportunity to participate in precollege programs on the UW-Madison campus has an added incentive: a chance to become comfortable with the university setting before they even apply.

UW-Madison's Upward Bound program helps make college a reality for some Madison high school students who are the first in their families to attend college or who come from low-income families.

"Upward Bound is designed to prepare students through the four years of high school with the necessary skills and with the motivation to fulfill their dreams of going to college," says Upward Bound Director Linda Lizana-Moss, who was the first in her family to attend college. "Most of the kids say they want to go to college. But knowing they want to go is one thing and knowing what they need to get there is something else. That's where we come in — we show them the path to college."

Maya Toral, who participated in Madison's Upward Bound program while a student at Madison East High School, says the program made her path to college smoother: The 1994 Upward Bound graduate is now a sophomore at Washington University in St. Louis.

Students like Toral have the potential to do well in college, says, Lizana-Moss, but because they are the first in their generation to consider college a real possibility, they require some extra nurturing and direction. They may not know which preparatory courses to take in high school, for example, or how to arrange college finances.

Beginning in ninth grade, selected students come to the UW-Madison campus after school and on Saturdays to receive tutoring, personal counseling, and academic and career advising, and help with study skills and social development. A computer lab provides up-to-date technical support for their work.

With the training, tutoring and advice they received from the Upward Bound staff, 10 students facing such odds were among the successful ones this year. Eight of Upward Bound's graduating seniors were accepted at UW-Madison, one was accepted at Milwaukee's Alverno College and one at the Madison Area Technical College.

The Upward Bound program was first created in 1964 by the Economic Opportunity Act and receives funding from the U.S. Department of Education's Office of Postsecondary Education.

Over the program's six years at UW-Madison, 16 of the Upward Bound graduates have gone on to attend UW-Madison (14 are currently enrolled) as well as several other campuses in the University of Wisconsin

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■ Some 2,500 K-12 students benefited from outreach presentations on plasma and microchips through the Engineering Research Center for Plasma-Aided Manufacturing. Some 89 undergraduates gave hands-on presentations to 73 local-area classrooms, allowing the engineering students to learn the rewards of outreach activities while teaching K-12 students about science and engineering via semiconductor manufacturing.

■ Youth Futures, a federally funded program offered through the School of Family Resources and Consumer Sciences, helps local communities develop programs aimed at preventing alcohol and other drug abuse, teenage pregnancy and other risky behaviors in young people. Youth Futures helps communities tailor these programs to serve the needs of their youth. More than 250 Wisconsin communities have completed the assessment surveys used in the program, and Youth Futures is currently operating in 18 communities.

■ A faculty member in electrical and computer engineering has developed a unique kit that shows students the basics of how computers work. The kit, which is complete with a variety of computer parts — integrated circuits, transistors and other components — unveils the mystery of things like Nintendo games and digital watches by letting the kids take a look inside. Teachers across the country use the kit, which was developed in tandem with Project 2061, a national effort to revamp the way students learn science sponsored by the American Association for the Advancement of Science.

System and around the country.

Upward Bound is one of the 100 organized campus Precollege Programs, which attract more than 11,000 K-12 students to UW-Madison. The programs focus on developing new knowledge and skills in the arts, academics and athletics. They also provide educational and research opportunities and help students correct deficiencies in their backgrounds.

The Badger sports camps for boys and girls prove to be the most popular. The largest non-sports program, the Summer Music Clinics, now in its 66th year, provides musical training for more than 1,100 orchestra, band, chorus and musical-theater students each summer. Another popular program, College for Kids, provides a full range of academic programs for gifted elementary school students.

In essence UW-Madison serves as a “K-12 University” where campus facilities, faculty and coaches work with youth from throughout the state.

■ School-age child care program helps families

With a growing number of children home alone, UW faculty have developed community-based programs to find solutions.

The family with a parent at home to greet children after school is the exception these days. With economic necessity pushing maternal employment rates up dramatically in recent decades, the result has been an increase in the number of latch-key children and “the 3-to-6 syndrome,” a situation observed by employers when employed parents are more concerned about their children’s safety than about their own work.

Research shows that very young children who supervise themselves are often terrified by the experience and can develop other problems as they grow up, according to David Riley, a professor in the School of Family Resources and Consumer Sciences’ Child and Family Studies Department and a UW-Extension specialist.

In response, Riley launched a program seven years ago that has helped many communities address the problem. The School Age Child Care program has recently released a seven-year report that shows its

measurable and impressive impacts in communities across Wisconsin.

Riley has found that the research on latch-key children needs to be tailored to the specific needs of Wisconsin communities. “Most research on latch-key children had been conducted elsewhere, often on the East or West Coast, and usually in large cities. People here did not see how the results applied to them and their communities,” Riley explains.

So he surveyed Wisconsin communities to identify how employed parents were meeting the challenge of after school child care and then used his survey results to help communities meet their needs. The findings led to local action, including training of families, forming local task forces and establishing new childcare programs.

The program has provided quality care for thousands of Wisconsin children. According to the “Seven Year Impact Report,” the School Age Child Care program helped establish 92 new childcare sites and 75 percent of these are still operating. In 1992, some 6,754 children were kept safe and productive in these programs, 16,359 families received face-to-face training from UW Extension agents on child care and self-care for youngsters, and 47,526 families received educational materials from Extension offices.

In a recent follow-up study, school teachers and principals reported they have seen reductions in problem behaviors and improvements in school performance as a result of the program. For example, they credited the program with reducing aggressive behavior, such as hitting and fighting, in one-quarter of the children.

One-third of the children have “become more cooperative with adults, more willing to follow the directions and rules of adults” as a result of the program. The educators reported that more than one-third had improved grades because of the program. They could even name 14 percent of the children in the program who would probably have been retained in grade if not for the program.

These are big impacts, Riley says, both in quality of life improvements and in public monies saved. If the estimates educators made are accurate, then the project is saving taxpayers over \$1 million per year by helping children do well enough to avoid having to repeat a year of schooling.

V OUTREACH & CONTINUING EDUCATION

OFFERING THOUSANDS OF FORMAL CLASSES AND TRAINING OPPORTUNITIES TO MAKE EDUCATION ACCESSIBLE

■ Based on the number of people who stayed in university housing, some 20,000 visitors from 85 organizations visited the UW-Madison campus this summer for a variety of educational opportunities.

■ The School of Business offers an Executive MBA program that allows high-potential managers to earn degrees without putting their careers on hold. The program, designed in conjunction with area business leaders, offers classes Friday and Saturday every other week for two academic years.

■ The School of Veterinary Medicine has developed the Dairy Health Management Certificate program to help veterinarians from around the state meet the changing needs of the dairy industry and to broaden their knowledge base. The interdisciplinary program is offered two days during the week over a two-year period so that practicing veterinarians may participate in the program while maintaining ties to their local communities.

■ The university's integrated outreach departments offer more than 2,000 professional and personal enrichment credit and noncredit programs for 160,000 people per year.

■ The Wisconsin Idea Seminar, an annual five-day journey around the state, is designed to introduce new UW-Madison faculty and staff to the outreach opportunities available in Wisconsin and to introduce them to the importance of public service in their roles at the university. Over 300 faculty and staff members have participated in the program since it began in 1984, meeting people from around the state from farmers to public school officials, business leaders to government leaders.

■ Institute helps businesses prepare for 21st century

Offering public and on-site seminars to business professionals around the state and nation, Management Institute provides industry the latest in management training.

Post-capitalist, post-industrial, late-capitalist — whatever trendy phrase you choose to describe the current economic state of society, one thing is certain: If businesses are to survive in the 21st century, they must keep up with the rapid technological changes and increasing global competition of the world economy.

UW-Madison's Management Institute, now a half-century old, reaches out to meet the ever-changing requirements of business by providing the professional development seminars industry needs to survive — and thrive. Management Institute faculty members with strong academic credentials, as well as hands-on experience in business, provide industry professionals with access to the latest management knowledge and technologies.

As a continuing education unit of the UW-Madison School of Business, in cooperation with UW-Extension, the Management Institute annually provides more than 300 public and on-site seminars and workshops to 9,000 business professionals who come from Wisconsin as well as around the world including Mexico, Australia and United Arab Emirates.

Business Week magazine, which ranks the Management Institute as one of the nation's top providers of continuing business education, praises the organization for offering "something for just about every managerial level and interest, from first-line, entry-level positions to senior executives." Comprehensive seminars focus on management skills; marketing, sales and customer service; finance and accounting; manufacturing systems and processes; procurement; and logistics, transportation, warehousing and distribution center management.

TDS Computing Services in Madison, one of the Management Institute's satisfied customers, has sent more than 175 of its employees to seminars since 1989. Marilyn Westmas, manager of professional development at the information systems company,

says, "The response from our employees is positive; they consider it a worthwhile use of their time. The instructors are aware of the current business environment, and the programs are very practical."

Sharon Crandall, systems analyst and project leader in the TELCOM Division of TDS Computing Services, says the Basic Management seminars she has taken have helped her develop a management perspective. "I understand that the goal is not just getting the work done," she says. "Now I try to motivate people and look for opportunities for people to grow and learn new skills."

The classes, Crandall says, have helped her strengthen her decision-making proficiency. "I learned that I didn't need so much information, so much detail. Now I take the best information I have at the time and quickly make a decision so we can move forward," she explains. She also learned strategies for scheduling, delegating, motivating and problem solving.

So far, Crandall has taken two of four units required for the Basic Management Certificate. The certificate is designed for first-level managers, supervisors and other business professionals who want to strengthen their management skills. Crandall says that somehow she will squeeze in the remaining two workshops she needs to receive the certificate. She is particularly busy now because, inspired by Management Institute seminars, she has begun to work on a master's degree.

■ Program offers education in a non-traditional mode

The College of Engineering's high-tech outreach program brings classes to the professionals at their worksites.

For some UW-Madison engineering students, going to school does not involve plowing through four feet of Wisconsin snow while trekking to Engineering Hall. In fact, some of the students have never seen snow.

For 120 Engineering Outreach participants, it's not just about keeping their feet and ears warm in the winter. For these practicing engineers, it's about keeping up with the latest technological innovations in the rapidly changing field of engineering.

"Most practicing engineers cannot come to us, so we bring education to them," says

OUTREACH & CONTINUING EDUCATION

■ The Division of Continuing Studies offers a newly designed noncredit Summer Chatauqua Program for learners in retirement. This summer more than 140 learners enrolled in the annual program, which is offered twice each summer.

■ Audio conferencing equipment and computers linked by phone lines permit interactive instruction in technical Japanese and German simultaneously to students on campus and at various business and educational sites around the country.

■ Windows on the World, a summer course that introduces a world region or country to university and special students, includes an associated program of extracurricular performances, talks and exhibitions.

■ With the goal of developing more effective ways to screen people for heart disease, the UW Medical School is using a \$3.5 million grant from the National Heart, Lung and Blood Institute to work with doctors in Wisconsin, Iowa and Minnesota. Medical School faculty will be visiting 156 physicians at 50 primary care sites to develop ways to educate patients about risk and prevention.

■ The Cross Cultural Health Care Initiative in the Department of Family Medicine focuses on teaching healthcare providers in Wausau about the unique cultural needs of the Hmong community, whose population has been growing rapidly there since the mid-1980s. The Bridge Community Health Care Center, which opened in April as a result of the initiative, serves minority, underinsured and underserved populations, the majority of whom are Hmong.



The Wisconsin Indian Story Theatre, the only such theater production in the country, has reached some 35,000 students from 300 schools around the state. Developed through the Department of Continuing Education in the Arts, the theatre combines storytelling with performance to tell tales handed down by generations of Wisconsin's Native American tribes.

Helene Demont, College of Engineering Outreach Program coordinator.

That might mean beaming courses to corporations by satellite uplink, or sending videocassettes to engineers at companies that enroll them in the college's program, or using interactive telephone-based technology to link working engineers with professors who are teaching the same courses to students on campus. Students choose from 32 classes each semester in chemical engineering, electrical and computer engineering, mechanical engineering, materials science and engineering, and nuclear engineering and engineering physics.

The Engineering Outreach Program enables engineers throughout the state, and across the country, to take classes from some of the best educators available without

having to quit their jobs or move their families to Madison.

For Kimberly-Clark engineer Greg Rajala, the first outreach student to receive a mechanical engineering degree, the outreach program allowed him to continue his full-time job in Neenah, Wis. while pursuing his master's degree at UW-Madison. "It would be quite a financial burden at this point to have to leave work and become a full-time student and keep my family together in one place," Rajala says. "With the outreach program, I was able to keep up with my studies and work at my own pace, while keeping up with other responsibilities such as my family and my job," he says.

The coursework gave Rajala "new tools and information" to apply to his job. Most recently, he was able to use some of the mathematical skills he learned in developing machinery for a new product line Kimberly-Clark released this summer. "I was able to use information that I had learned in my master's degree to solve problems in the machines," says Rajala, who adds that he is now thinking of going back for his Ph.D. so that he can eventually teach other engineers.

Like Rajala, engineers benefit from the program through specialized training and career advancement. Some turn to the program to fulfill course requirements before applying to graduate school in Wisconsin. Others simply want to enrich their knowledge and need the strict deadlines of school and the expertise of UW-Madison faculty and staff to guide them. Students working toward master's degrees need approximately five years to complete their program.

The Engineering Outreach Program office has seen many changes since its inception. In the 1982-83 school year, only two courses were offered to 20 enrolled students. Today, the figures have grown to include 32 classes and 120 students. Demont is confident that as communication technology progresses, Engineering Outreach will progress right along with it. That means that more engineers in Wisconsin will have access to the courses and knowledge they need in their careers.

■ The School of Veterinary Medicine offered a summer workshop, "Celebrate Diversity: Enhancing the Learning Environment in Veterinary Medicine Education," for 31 veterinary colleges around the United States and Canada.

■ Teachers of all subjects and ages can participate in a summer colloquium on enhancing the quality of teaching. In the colloquium, UW-Madison instructors who have received Distinguished Teaching Awards work with teachers to improve teaching.

■ The newly established Center for International Programs in Government offers short-term programs on governmental policy and processes for governmental officials from foreign countries. Officers of the Budget Bureau of Thailand participated in the center's first program.

■ By broadcasting a class on developmental disabilities on WHA, the School of Social Work makes available this course to a variety of human services agencies, parents and others associated with developmental disabilities. In all, some 12-14 counties have taped this broadcasted course for use in training and education.

■ Engineering Professional Development provides 380 on-campus programs serving 15,000 engineering professionals each year.

■ Through the Center for Public Representation's Clinical Program, which is affiliated with the UW-Madison Law School and staffed by clinical law faculty, law students participate in hands-on internship opportunities while working with Wisconsin residents to provide legal assistance and education. For example, students have been instrumental in assisting low- and moderate-income families to obtain health care financing and access to affordable telephone service.

■ Continuing education helps fulfill the public's trust

Program provides government officials the training and knowledge they need to better serve the state.

Norma DeHaven and Ronald Buchholz are government officials who take their responsibilities as public servants very seriously. One way they've done that is to participate in an in-depth continuing education program for public managers conducted through UW-Madison's Division of Continuing Studies.

Begun just five years ago, the Wisconsin Certified Public Managers Program is attracting many middle and senior government managers from throughout the state who want to better meet the demands of their jobs.

That was why Buchholz, deputy administrator of the Division of Safety and Buildings in the Wisconsin Department of Industry, Labor and Human Relations, enrolled.

"At first I just wanted to take a course on strategic planning," he says. "But most courses taught by consulting firms and other colleges focused on planning as it related to managers in private business. The class at UW-Madison was the only one I found that focused specifically on the needs of workers in public sector management. The class was so good, I decided to enroll for the entire series of management programs."

Each semester the Wisconsin Certified Public Managers Program offers eight to 10 classes in such subjects as leadership, ethics in government, quality improvement, performance evaluation, budgeting, conflict management and risk management. To become nationally certified, participants must attend 300 hours of classes, take several exams and complete outside projects. The entire course of study usually takes three years.

DeHaven, city manager for the city of Fitchburg, says one of the most remarkable aspects of the program is its ability to provide participants with a broader view of their role in government. "One of our common mistakes in government is to get too narrowly focused on our particular job," she says. "The program helped me see that most managers in government have a commonality

of concerns: You aren't the only one struggling with a particular issue or challenge."

More than 200 managers from all levels of state and local government throughout Wisconsin are enrolled in the program. Susan Paddock, director of the program and a UW-Madison assistant professor of governmental affairs, says, "We've been impressed with how many Wisconsin public managers are willing to spend a great deal of their time to study and better understand their roles and responsibilities in government. They are living up to the public trust placed in them."

In addition to the public managers courses, continuing education departments in the Division of Continuing Studies and other UW-Madison schools and colleges offer more than 2,000 classes each year in areas of both professional development and personal enrichment.

The Division of Continuing Studies offers such programs as a weekly evening French class at Lowell Hall, an all-day workshop on using the Internet at the Wisconsin Center, a six-session medieval history class at West High School, an accounting seminar in Grainger Hall, a series on tax law and a class on recent award-winning children's books via Extension's Educational Teleconference Network, a book talk series on American novelists at the Madison Public Library, a three-day conference on distance teaching at a local hotel, and others.

UW-Madison continuing education courses make it possible to share the resources of the university with more than 140,000 citizens of Wisconsin annually as they update their knowledge of their current professions, prepare themselves for new careers, develop new skills, adapt to changes in the workplace, and expand their knowledge and creative interests.

■ Engineering Professional Development developed a course on engineering project management for Johnson Controls Field Service Engineers. The course will be delivered through Internet e-mail and audiographic teleconferencing; a pilot test to 20 students at three Johnson Controls locations was completed this summer.

■ The Great Lakes Indian Law Center, a clinical program at the Law School, serves as a legal resource and offers research expertise for Native American tribes in Wisconsin. The center also provides internships and hands-on legal training for UW law students interested in American Indian legal issues. The center helped the Ho-Chunk Nation of Wisconsin restructure its outdated constitution.

■ School of Library and Information Studies continuing education courses are helping keep hundreds of librarians across the state in the forefront of the electronic age. Through workshops — some of which are accessible to rural areas via distance education — librarians stay current on information technology.

■ The Wisconsin Alumni Association's Spring Day on Campus and the week-long Alumni University provide people from throughout Wisconsin with a chance to visit campus and attend seminars offered by world-class faculty. Course topics range from research breakthroughs to economic issues to the arts.

■ Engineering Professional Development developed a new solid waste management course, which was attended by representatives from eight Native American tribes from across the United States.

■ Classes assist nurses in meeting new state statute

New coursework in distance education program helps health care professionals keep abreast of the latest developments and provide quality health care to Wisconsin.

Two new distance education initiatives involving the Schools of Pharmacy, Nursing and Medicine are paving the way for advanced practice nurses to get the courses they need to prescribe medications under a new state statute.

Effective April 1, 1995, an estimated 2,000 state advanced practice nurses can prescribe medications, provided they have the necessary coursework in areas dealing with drugs, pharmacological preparations and pharmacology.

UW-Madison has stepped in to fill this need by developing a noncredit distance continuing education program to meet the needs of professionals practicing in the field, explains Patricia Lasky, associate dean in the School of Nursing. The program consists of eight two-hour sessions offered weekly in the evenings.

To reach out to students in Platteville, Milwaukee, Madison and other sites, the schools developed a way to offer the courses through two-way video conferencing.

"Video conferencing was very convenient and effective. The short classes offered close to home allowed me to keep my attention focused and observe more than I usually do," says Nancy Swailes, a geriatric nurse practitioner from Memorial Hospital of LaFayette County in Darlington, one of the more than 60 nurses who have taken the course. "There was plenty of time for questions and answers, and the hands-on sessions covered the situations we deal with well."

Swailes' classroom in Platteville allowed for live video and audio interaction between the UW-Madison faculty and students at the sites. "The other option was to drive to Milwaukee or Madison for an eight-hour-long seminar. This option worked better," she says.

The schools also developed a graduate-level credit course and offered it via a two-way interactive compressed video link during 1995 Summer Sessions to some 90 physician assistants and advanced practice nurses at UW-Madison and UW-Oshkosh.

"This distance education project on drug therapy for primary care providers will help advanced practice nurses and physician assistants better meet the health care needs of citizens in rural and urban settings, and underserved areas," says Allan Mailloux, an assistant professor in the School of Pharmacy, who served on a state advisory committee that helped draft the rules allowing nurses to write prescriptions.

Commitments to provide continuing education at a distance are part of a longer-term effort. The School of Nursing has offered courses over the UW-Extension Educational Teleconference Network to community and hospital sites for 30 years. The school is now working with UW-Extension on a collaborative distance education bachelor's degree with UW-Eau Claire, UW-Green Bay, UW-Oshkosh and UW-Milwaukee targeted toward some 9,000 state nurses who have associate degrees. All courses will be available via distance education with the first two offered in January 1996.

The Medical School also offers a master's degree for physicians in hospital administration using distance education, supplemented by two-week visits to campus each year.

And, chances are if you visited your pharmacist recently, he or she is one of the 70,000 pharmacists who takes UW-Madison noncredit courses from Extension Services in Pharmacy each year via self-directed, accredited units in a popular pharmacy journal.

■ Librarians find answers to technical questions

UW-Madison's nationally known research libraries offer up-to-the-minute knowledge to help the state maintain a critical edge in the information age.

A critical stab wound. A terminal illness. Pickle brine waste. Cancer-prevention effects of nutritional additives. Old landfills. And patents — lots of patents.

These are all topics for which businesses, professionals and citizens throughout Wisconsin rely on experts at campus research libraries for up-to-the-minute information in science, technology, agriculture, law and medicine. From Cumberland Memorial Hospital in the northwest section of the state to Rust Environment and Infrastructures in

OUTREACH & CONTINUING EDUCATION

■ The School of Family Resources and Consumer Sciences held its second week-long Wisconsin Child and Family Advocacy Institute in July 1995. The program was designed to train family specialists working in the field in how to get the information and resources they need to improve the climate for families in their communities.

■ The Wisconsin Family Policy Impact Legislative Seminars teach legislators and other public policy officials about the effects of policies on families. The seminars are a project of the School of Family Resources and Consumer Sciences' Center for Excellence in Family Studies, whose mission is to promote research in family studies and share information with the public.

■ The Legal Assistance to Institutionalized Persons Program provides criminal and civil legal aid to prisoners and mental health patients while giving law students the opportunity to put their legal knowledge and training to good use. Law School students represent clients and patients incarcerated in the Wisconsin Correctional System, the federal prison at Oxford and the Mendota Mental Health Institute.

■ Participatory Learning and Teaching Organization (PLATO), a learning-in-retirement, member-led organization sponsored by the Division of Continuing Studies, Office of University Special and Guest Students, provides learning experiences for people of or nearing retirement age. Over 150 current members participate in programs and receive a bi-monthly newsletter. This summer, for example, activities included two tours of the Olbrich Gardens, a four-session lecture series on the history of Wisconsin, and a five-week series on race relations.

Sheboygan, library outreach services at UW-Madison serve all of Wisconsin's major industries and hundreds of small companies.

Approximately 50,000 requests for information were filled last year by staff at the Medical Library Service and four other library outreach services on campus. These requests, for which the libraries charge a "cost-recovery" fee, came from more than 1,000 clients in 61 Wisconsin counties. Requests are increasing at more than 10 percent per year.

Library information services are an old and venerable component of the Wisconsin Idea. The Medical Library Service, for example, has been helping the state since the 1920s. The primary importance of UW-Madison in providing statewide information was acknowledged by the state legislature in the 1970s when Wisconsin Interlibrary Services was established in campus libraries. Since then the interlibrary service has provided millions of books, journal articles and information searches to citizens through their local public, school, academic and special libraries.

The newer, highly automated information outreach services are an outgrowth of this continuing commitment to share the knowledge resources of the campus.

For Barb Bartkowiak of the Marshfield Clinic, immediate access to the latest medical information is crucial. "Patient care is not something you can plan ahead," she notes. "When a doctor is doing emergency surgery in an hour, he or she needs information immediately."

The clinic, a multi-specialty medical facility serving patients in central Wisconsin, sends requests to the UW's Health Sciences Libraries' Medical Library Service almost daily. "Madison's response is always timely," says Bartkowiak. "They take our needs seriously."

Besides assisting physicians and hospitals, Health Sciences Libraries' experts also deal with individual requests. Because of the librarians' knowledge and sensitivity, the state's Reference and Loan operation refers to the libraries all questions from citizens regarding diseases with poor prognoses or disabling symptoms. The requester receives a prompt, personal response from trained medical librarians.

The services provide searches of specialized databases (available because of the campus's research activities), technical materials not found elsewhere in the state and government documents. Staff are familiar with the universe of information in a given subject in both printed and electronic formats.

Wisconsin TechSearch, an outreach service located in Wendt Engineering Library, is one of the largest. The service provides "untold value," according to Mike Mattes, senior scientist at SSI Technologies, a Janesville automotive sensor corporation with a national market. "Information is vital," says Mattes, who uses TechSearch for literature searches, patent searches and a current awareness service, which lets him know what is newly available in the fields in which he is interested.

The ability to cross-match a number of disciplines is also important, states Jerry O'Dea, director of product and market development at Avonmore Ingredients in Monroe. Avonmore, a developer of new food ingredients and client of the Steenbock Agricultural and Life Sciences Library service, uses information in the agricultural, food science and medical science fields. O'Dea says he would have to spend months in libraries on his own to find what the Steenbock service readily finds for him.

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